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The determinants of non-consumption of disposable plastic: application of an extended theory of planned behaviour

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Abstract: The main purpose of this study is to explore a framework to predict the non-consumption of disposable plastics behaviour, using the theory of planned behaviour and a further extension adding two new variables to the model: social media engagement and lifestyle values. The empirical research builds on a survey with a sample of 466 individuals using an online questionnaire. Data analysis followed a PLS-SEM approach, to test the group of hypotheses. The group of predictors of social media engagement, lifestyle values, attitude, perceived behaviour control, and intention explain 39,7% of the variance of the expected behaviour of no-use of disposable plastic, which is considered a high value in the consumer behaviour domain. Together, the results show that the theory of planned behaviour proved its applicability in explaining social behaviour and that social media engagement is a very relevant predictor of lifestyle.

Keywords: sustainable consumption; disposable plastics; theory of planned behaviour; social media engagement; lifestyle; structural equation modelling; PLS-SEM.

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1 Introduction

The planet is awash in plastic. The massive increase in plastics production, coupled with the widespread use of disposable plastics and the widespread mismanagement of plastic waste, has created a huge tragedy notably in the oceans. Plastic pollution is now a global externality that damages ecosystems reduces biodiversity and has the potential to affect everyone on the planet (Barnes, 2019). According to the United Nations (UN), if humanity maintains its consumption patterns at the current pace and does not change the way it treats its waste, by 2050 we will have around 12 billion tons of plastic in landfills or in the nature and oceans may have more plastic than fish (UN Environment, 2019). Every year, around 300 million tons of plastic waste are generated (UN Environment, 2019). A large part is meant to be used only once. This is the case of packaging, which in 2015 accounted for almost half of the plastic waste produced, with special emphasis on disposable plastics such as cutlery, plates, bottles, and cotton swabs, but also the plastic from billions of cigarette filters (UN Environment, 2019).

More than 60 countries and institutions have put in place action plans to limit single-use plastics, with an estimated 1–5 billion plastic bags being used worldwide per year (*Plásticos de utilização única*, 2020). Public opinion has reacted favourably to this type of ban due to the perception of the harmful impact of single-use plastics on marine environments (Brewster, 2020). Providing decent lives and well-being for nearly 10 billion people by 2050, without further compromising our planet's ecological limits and its benefits, is one of the most serious challenges and responsibilities humanity has ever faced (UN Environment, 2019). The bad effect of disposable plastics is not only felt at the ocean level with a direct implication in the death of fish and birds but also in water and in fruits and vegetables for human consumption. A report by the World Health Organization critically examines the evidence related to the occurrence of microplastics in the water cycle (including both drinking water distributed through pipelines and bottled water and its sources) (World Health Organization, 2019).

Recent studies have found that micro and nano plastics are present in the vegetables and fruits we eat (Conti et al., 2020; Gerritse et al., 2020). It is through the water absorbed by the roots that micro and nanoplastics 'enter' food. These new discoveries pose a danger to the human condition. In fact, according to research presented at the

American Chemical Society conference, microplastics and nanoplastics have been detected in human organs and tissues (American Chemical Society, 2020) and more recently microplastics have been found in human placentas (Ragusa et al., 2021). This is a worrisome finding, even though information about the health effects is lacking.

Environmental protection has only recently become a more relevant aspect in human decision-making, and it can be understood as a behaviour that is undertaken with the aim of altering (usually to benefit) the environment (Stern, 2000). In this sense, we are witnessing the emergence of significant movements in the USA, Europe and other developed countries that seek sustainable consumption and lifestyle (Schroeder and Anantharaman, 2017). To promote a sustainable planet, consumers will have to reduce their level of consumption and/or modify the types of goods they consume (Buenstorf and Cordes, 2008). Given the wide spectrum of environmental problems that are produced by human behaviour, it is necessary to identify ways to change people's environmental attitudes and behaviour caused by unsustainable consumption (Bleys et al., 2018). Much environmentally significant behaviour are matters of personal habit or household routine or are highly limited by household income (Stern, 2000).

This study has the general objective to investigate environmental behaviour in the purchase, use, and disposal/recycling of disposable plastic products, such as cutlery, plates, bottles, cotton swabs, bags, and packaging for food products, among others, using an extension of the theory of planned behaviour (TPB).

Scholarly research on pro-environmental behaviours using the TPB framework has focused on several domains, such as waste recycling/management (Mahmud and Osman, 2010; Pakpour et al., 2014), sustainable consumption (Liobikienė et al., 2016; Paul et al., 2016; Yadav and Pathak, 2016), plastic waste (Khan et al., 2019; So et al., 2021), and reduction of the plastic use (Aruta, 2022; Aslam et al., 2019; Batooli et al., 2022; Gulid and Yansomboon, 2022; Sun et al., 2017). Most of the existing studies tended to focus on only consumer intention to reduce the use of plastics instead of the actual behaviour (Aruta, 2022; Aslam et al., 2019; Batooli et al., 2022; Sun et al., 2017). The novelty of our study lies in the fact that, to the best of our knowledge, no study has investigated the non-consumption of disposable plastics' actual behaviour.

Also, none of the studies on reducing the use of plastics extends the TPB with constructs of lifestyle and social media engagement. The most used predictors are environmental knowledge (Hasan et al., 2015), environmental concern, ethical belief, convenience (Sun et al., 2017), and religiosity (Aslam et al., 2019). So, our specific aims are to add the role of social media engagement and lifestyles to the TPB framework. Additionally, we intend to explore the moderator effects of control variables as gender, age, education, and household.

The rest of this work is organised as follows: next, we presented the literature review about TPB, LS and SME, followed by the conceptual model and hypothesis. Section 2 presents the methods and materials used in the research, providing information about data collection and participants, and measures used in the research models. Section 3 presents the results of the measurement models and structural model. In Section 4, we discuss the results, and in Section 5, we concluded the study by presenting the implications for theory and practice, as well as the limitations of the study and future research possibilities.

1.1 Theory of planned behaviour

TPB remains one of the most used behavioural theories for the study of individual behaviours (Yuriev et al., 2020). Moreover, past studies have used the TPB as a robust model that helps in understanding the predictors of people's pro-environmental behaviours (Aruta, 2022). Specifically, previous research has used the TPB to determine the predictors of plastic use intention and behaviours (Aruta, 2022; Aslam et al., 2019; Batooli et al., 2022; Gulid and Yansomboon, 2022; Khan et al., 2019; So et al., 2021; Sun et al., 2017).

TPB advocates that behaviour stems from individual intentions and perceived behavioural control (PBC). Intentions refer to the motivational factors that influence behaviour and are defined as "indicators of how hard people are willing to try, …, in order to perform the behaviour" [Ajzen, (1991), p.181]. Environmentally behavioural intention is an individual's willingness to engage in a specific behaviour for environmental conservation and indicates how much effort has been devoted to a given behaviour (Panwanitdumrong and Chen, 2021). Intentions depend on three direct predictors: attitudes, subjective norms and PBC.

Attitude towards behaviour is defined as an individual's favourable or unfavourable assessment of the behaviour in question (Ajzen, 1991). Sun et al. (2017) suggested that attitude toward plastic bags usage is an emotional reaction which is originated from consumer's assessment. According to the TPB's theoretical framework, attitude is an effective predictor variable driving behavioural intention that can explain and predict the intention (Panwanitdumrong and Chen, 2021).

Subjective norms refer to the social pressure perceived in relation to the behaviour, that is, it reflects the perception of the social pressure that individuals may feel to perform the behaviour (Ajzen, 1991). Social pressure can be seen in the form of pressure from family, friends, peer groups, etc. (Khan et al., 2019). Norms are stronger predictors of pro-environmental intentions and behaviours (Aruta, 2022).

PBC is the personal assessment of the feasibility of performing the behaviour in each context, assuming it reflects past experience as well as anticipated impediments and obstacles (Ajzen, 1991). The control of the individual over his/her activities also affects the intentions towards plastic recycling intentions (Khan et al., 2019). The recent research found significant results in perceived behaviour control toward plastic bags usage intention (Sun et al., 2017).

The more favourable the attitude and subjective norm towards the behaviour, and the larger the PBC, the stronger the intention of an individual to carry out the behaviour under consideration (Ajzen, 1991). However, in some behavioural studies, only attitudes have a significant impact on intentions, in others, attitudes and PBC are sufficient to explain intentions, and in still others, the three predictors independently contribute to the behaviour in question (Ajzen, 1991). For example, several studies on reducing plastic use demonstrate that PBC had the highest impact on consumer intention (Aslam et al., 2019; Gulid and Yansomboon, 2022; Hasan et al., 2015).

1.2 Social media engagement

Social media engagement behaviours comprise two key elements, namely, social media and consumer engagement behaviour (Cao et al., 2021). The term social media refers to online tools designed to facilitate collaboration and the sharing of knowledge and ideas

through social interaction between individuals, groups and organisations using Internet and Web technologies (Alt, 2018; Smith and Gallicano, 2015; Go and You, 2016). According to Barrot (2021), social media is related to internet-based applications used for image sharing (e.g., Instagram), information organisation (e.g., Pinterest), photo or video messaging (e.g., Skype), instant messaging (e.g., WhatsApp), or a combination of all (e.g., Facebook).

To Smith and Gallicano (2015), engagement is a state of mind and emotion, a level of engagement that comprises social media activities, but is simultaneously distinct from those activities. Interactive engagement involves an interchange of information and responsiveness between two or more online users that are not necessarily in real-time (Camilleri and Kozak, 2022). While engagement requires social media interactivity, that interactivity may not be enough to be engaged (Smith and Gallicano, 2015). The term social engagement is used to refer to sharing individual or social information with the closest social environment, such as family and friends, using virtual social media platforms (Alt, 2018). It is what Gammoudi et al. (2022) call socialisation, i.e., the process through which individuals acquire the knowledge, skills, attitudes, values, norms, and appropriate actions of their community.

Users of online communication tools are becoming increasingly active in creating environmentally conscious content, with the intention of influencing mainstream opinion (Han et al., 2018) and several online virtual communities were created to encourage sustainable behaviour of individuals (Langley and van den Broek, 2010). The behaviour and perception of individuals can be strongly predicted by the information posted on these platforms (Malthouse et al., 2013). Internet and blogging developments have created many opportunities to bring people closer to environmental issues. These new interactions are now an important root of environmental citizenship (Luck and Ginanti, 2013). Ballew et al. (2015) report that social media technologies can facilitate the communication of psychological and sociological or tangible factors to influence pro-environmental behaviour, while Kanter and Fine in Sogari et al. (2017) show how social networks can actively promote environmental awareness and a sustainable lifestyle.

Thus, it appears that social media technologies have a huge potential to amplify environmental concerns and encourage sustainable behaviours among people (Sogari et al., 2017), being particularly effective in promoting social norms that support environmentally responsible behaviour (Ballew et al., 2015).

1.3 Lifestyle values

Values are considered as the criterion that individuals use to select and justify their actions and value objects and the behaviour of others (Fraj and Martinez, 2006). Values play a key role in consumer decision-making and give emotional intensity to their actions (Čapienė et al., 2022). They are typically conceptualised as important life goals or as patterns that serve as guiding principles in each person's life (Poortinga et al., 2004). According to Čapienė et al. (2022) people are guided by principles or values rather than the potential consequences of their actions in making a decision to behave sustainably. As such, values can provide a basis for forming attitudes and act as guidelines for behaviour. Along with values, personal moral norms are the main basis of individuals' general predispositions for pro-environmental action (Stern, 2000). While values may remain

unchanged over time, however, as there is growing concern for the environment, individuals are changing their values and lifestyles related to environment (Fraj and Martinez, 2006).

Several studies show that values contribute to explaining different environmental attitudes and behaviours. De Young (1985) concludes that an austere and moderate lifestyle is positively related to recycling glass and paper, while Dunlap and van Liere (1984) argue that liberal values are related to a greater interest in and concern for the environment. On the other hand, using the Schwartz values scale, Schultz and Zelezny (1999) explain how values predict general environmental concern, and Karp (1996) demonstrates that Schwartz values are significantly correlated with various self-reported behaviours, such as recycling behaviour, consumer behaviour and even political behaviour to protect the environment.

Lifestyle encompasses one's beliefs, values, identities, behavioural patterns, and practical and cultural commitments to certain practices of consumption (Elf et al., 2019). The latest trends show that the behavioural lifestyle of individuals tends to reflect a general intention to protect the environment (Arnold et al., 2018). In fact, sustainable consumption requires redoubled efforts in the sociological and psychological factors that determine consumption choices, essentially focusing on social identity, habits and practices related to cultural values and norms (Schroeder and Anantharaman, 2017).

1.4 Conceptual model and hypothesis

The TPB is recognised by academics for having a flexible structure. Although in the original model, behaviour is influenced only by two direct predictors (intention and perceived behavioural control), researchers usually include additional variables such as self-identity (Mannetti et al., 2004), past behaviour (Richetin et al., 2012), moral norm (Wan et al., 2017) and other variables. In studies related to reducing the use of plastics scholars use predictors like environmental knowledge (Hasan et al., 2015), environmental concern, ethical belief, convenience (Sun et al., 2017), and religiosity (Aslam et al., 2019). Moreover, Ajzen (1991) indicates that the TPB framework can be modified by adding new constructs or altering the path of the variables in it. Given that the TPB allows for the incorporation of additional variables, whereas these variables make an important contribution to explaining behaviour, this study incorporated two additional variables (social media engagement and lifestyle) which influence direct and indirectly the behaviour.

This model is indicated to explore one behaviour at a time (Yuriev et al., 2020), that is, it is useful to identify specific factors that affect an action regarding particularly desirable (e.g., recycling) or harmful (e.g., use of disposable plastics).

In accordance with the above, the following research model is proposed (Figure 1), an extension of the TPB model by Ajzen (1991).

Thus, the following research hypotheses are stipulated:

H_{1A} Attitudes towards not using disposable plastic products have a positive effect on consumers' intentions not to use this type of product.

H_{1B} The social pressure exerted on consumers (social norm) has a positive effect on consumers' intentions not to use disposable plastic products.

H_{1C} Consumers do not foresee impediments or obstacles in their intention to not use disposable plastic products.

H_{1D} Consumers find it feasible (positive evaluation) not to use disposable plastic products.

H_{1E} Intentions regarding the non-use of disposable plastic products have a positive effect on the behaviour of consumers in not using this type of product.

The use of social media technologies can not only stimulate discussion among friends and family but also with strangers, which will likely influence people's perceived descriptive social norms and their expectations regarding behaviour (Xiang and Gretzel, 2010). This sharing of information through social media applications allows users to see the actions of others and encourage them to take actions accordingly (Langley and van den Broek, 2010), and therefore social feedback can lead people to adopt certain behaviours. This sharing of experiences among social media users grants active members recognition of their activities, which can be an incentive for other members to be active as well (Cummings et al., 2002). Social media is becoming increasingly influential in shaping individuals' decision-making as more and better quality information is made available (Hajli, 2018). The impact of the social environment on individual consumer behaviour is further increased through the important motivating role of social recognition (Buenstorf and Cordes, 2008). Social media technologies must be effective in communicating and promoting social norms that support environmentally responsible behaviour (Ballew et al., 2015). Moreover, social influences affect individuals' behavioural intentions (Zheng et al., 2022).

Based on the above, we formulate the following research hypotheses:

H_{2A} Social media engagement is positively related with the social pressure on consumers to not use disposable plastics.

H_{2B} Social media engagement is positively related with consumers' lifestyle.

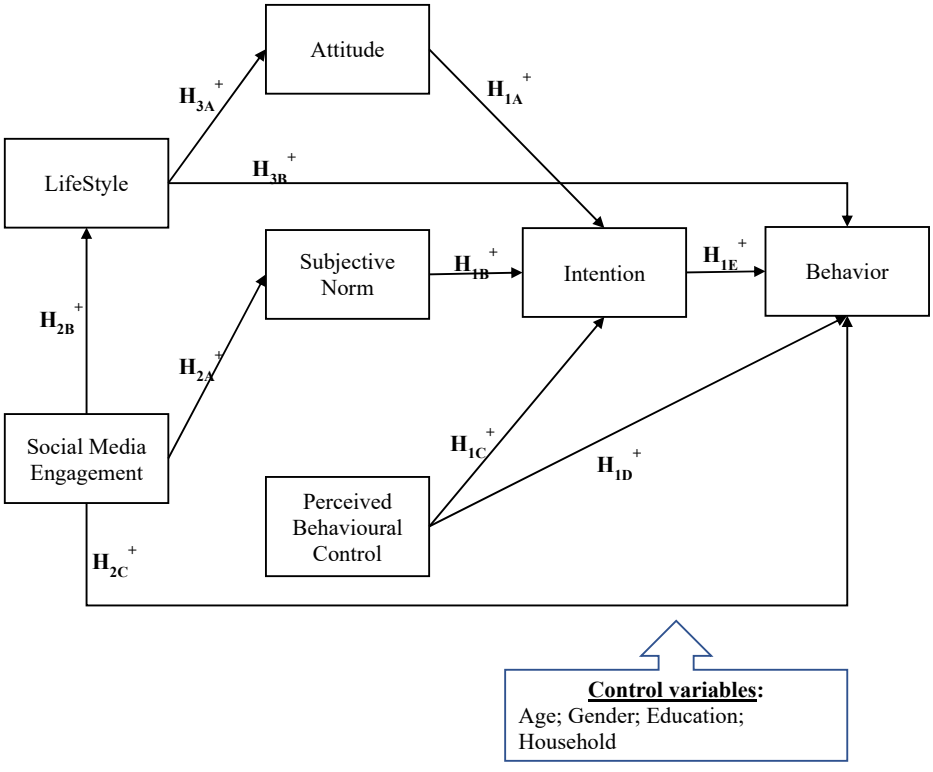
H_{2C} Social media engagement has a positive effect on consumer behaviour in not using disposable plastics.

According to Stern (2000), values are important guiding principles for individual decisions and behaviours related to their environmental impact. People who behave, for example, in an environmentally sound way, express their value of respect for nature, have a positive attitude towards the purchase of ecological products, recycle and participate in environmental protection activities (Fraj and Martinez, 2006). According to the theory of value-belief-norm, values influence environmental attitudes, awareness of behavioural consequences, and assumption of responsibility and contribute to the pro-environmental behaviour (Minelgaitė and Liobikienė, 2021). Values influence attitudes toward the environment, perceptions of the consequences of behaviour, and acceptance of responsibility, and contribute to environmentally friendly behaviour (Jančius et al., 2021). As a result, we established the following research hypotheses:

H_{3A} Lifestyle values are positively related to consumers' attitudes toward not using disposable plastics.

H_{3B} Lifestyle positively affects consumer behaviour in not using disposable plastics.

Figure 1 Research model (see online version for colours)



2 Methods and materials

Based on an extended TPB model, this study follows an exploratory, empirical, and quantitative methodology. The questionnaire includes measures for each variable identified in the ten hypotheses listed for the model test, using a structural equation approach.

2.1 Data collection and participants

The first task associated with the questionnaire consisted of following the translation-backwards-comparison process (Malhotra, 2010), to ensure the clarity and effectiveness of the data collection instrument. We tested the questionnaire with a small sample of 30 responses for the purpose of understanding and validating the questions. After meeting the reliability requirements, we draw an online self-administered questionnaire using the Qualtrics platform (http://www.qualtrics.com).

To draw our sample, we used non-probability sampling methods like convenience and snowball samplings. We use a convenience sample, where there are no inclusion requirements, for recruiting subjects who are easy to contact and willing to participate. So, we send emails to Universidade Europeia (Lisbon, Portugal) and Universidade Lusófona (Lisbon, Portugal) students with a link to the questionnaire. At the same time,

using a snowball sampling method, we asked students to find and recruit other people, like friends and family (in an older age group) to answer the questionnaire. Data were collected during July 2019, and a sample of 466 valid answers was received. Analysing the respondent's sociodemographic characteristics, we concluded that participants are mainly female (63.9%), under 25 years old (64.6%), living in a less than 3 persons household (52.6%), and are mainly undergraduate students (61.8%).

Responses do not contain missing values. Non-parametric Mann-Whitney tests were also applied to check the differences between early respondents and late respondents. As no significant differences were found, it is concluded that there is no non-response bias.

Because of the type of data collection process used, common method variance may influence some postulated relations in the PLS path model (Klarner et al., 2013). So, we run an unrotated, single-factor constraint of factor analysis (Harman´s single factor test) in IBM SPSS Statistics for common method bias. The first factor, extracted using principal axis factoring without rotation, accounts for only 20% which is below of 50% cut-off point (Podsakoff et al., 2003). We conclude that common method variance is not a critical issue for this study.

Only four of the 34 variables (11.7%) present nonnormality with skewness or kurtosis absolute values greater than one (outside of the –1 to +1 acceptable range), exhibiting a slight degree of non-normality.

To analyse potential outliers, we run a series of box plots using IBM SPSS Statistics software and we find a small percentage of outliers (75/466 = 16%). As they are moderate outliers and they are not due to data collection or entry errors and as there is no clear explanation for the exception values, outliers were retained (Hair et al., 2017).

The sample size is not an issue because we have 466 cases which are greater than ten times the maximum number of paths aiming at any construct in the measurement model (i.e., the number of formative indicators per construct) and structural model (i.e., the number of path relationships directed at a particular construct) (Hair et al., 2012b).

2.2 Measures and descriptives

Measurement model misspecification is a threat to the validity of SEM results, insofar as modelling latent variables reflectively when the conceptualisation of the measurement model should be a formative specification can result in biased results (Hair et al., 2017). Based on the TPB literature and more precisely in the research in sustainable consumption (Kim and Chung, 2011; Liobikienė et al., 2016; Paul et al., 2016; Vermeir and Verbeke, 2008; Yadav and Pathak, 2016; Zagata, 2012), all multi-item measures in this study have been conceptualised to denote manifestations of the underlying construct. Consequently, we use reflective measurement models for all the constructs presented in the research model (Figure 1).

The measurement instrument is composed of three distinct components: TPB, social media engagement and lifestyle values.

The TPB measures were evaluated from 30 items designed to assess the five TPB constructs and were adapted from Ajzen et al. (2011). All items were contextualised to the target construct (i.e., non-consumption of disposable plastic). For example, perceived behavioural control items originally designed to measure college students perceived personal capacity to engage in energy-saving behaviours (see Ajzen et al., 2011) were revised to the target of non-consumption of disposable plastic for the present study.

Answers to all items were given on 5-point scales (Tables 1–5).

Attitude toward the behaviour: the use of disposable plastic was rated on six bipolar adjective scales as followed (Table 1).

Table 1 Attitude toward the behaviour scale

Items		*Min*	*Max*	*Mean*	*SD*
ATT01	For me, the use of use of disposable plastic products is (very pleasant – unpleasant)	1	5	3.73	1.09
ATT02	For me, the use of use of disposable plastic products is (strongly like – strongly dislike)	1	5	3.69	1.09
ATT03	For me, the use of use of disposable plastic products is (very positive – very negative)	1	5	4.04	1.14
ATT04	For me, the use of use of disposable plastic products is (extremely desirable – extremely undesirable)	1	5	3.85	1.10
ATT05	For me, the use of use of disposable plastic products is (extremely wise – extremely unwise)	1	5	3.90	1.05
ATT06	For me, the use of use of disposable plastic products is (extremely good – extremely bad)	1	5	3.94	1.05

Note: Min – minimum; Max – maximum; SD – standard deviation.

Subjective norm: six items were used to assess the subjective norm (Table 2), four of which assess the injunctive norms that question the expectations perceived by important people (SBN01 to SBN04) and two the descriptive norms that refer to the perceived behaviour of others (SBN05 and SBN06). All responses were provided on a 5-point scale with endpoints labelled either *strongly disagree* and *strongly agree*.

Table 2 Subjective norm scale

Items		*Min*	*Max*	*Mean*	*SD*
SBN01	People whose opinions I care about not approve of my use of disposable plastic products last three months	1	5	3.45	1.08
SBN02	People I care about not encourage me to use of disposable plastic products last three months	1	5	3.30	1.13
SBN03	I feel social pressure to not use of disposable plastic products last three months	1	5	2.95	1.18
SBN04	People who are close to me not would approve of my use of disposable plastic products last three months	1	5	3.2	1.10
SBN05	Most people like me are not going to use of disposable plastic products next three months	1	5	2.75	1.01
SBN06	Most people who are important to me currently not use disposable plastic products	1	5	2.70	0.10

Note: Min – minimum; Max – maximum; SD – standard deviation.

Perceived behavioural control: the six items used to measure PBC (Table 3) are based on the feasibility of taking certain actions over the following two weeks.

Table 3 Perceived behavioural control scale

Items		*Min*	*Max*	*Mean*	*SD*
PBC01	If I wanted to, I could easily not use disposable plastic products next two weeks	1	5	3.62	1.17
PBC02	Whether I not use disposable plastic products next two weeks is entirely up to me	1	5	3.63	1.17
PBC03	It will be difficult for me to not use disposable plastic products next two weeks	1	5	3.24	1.21
PBC04	I should have no trouble not use disposable plastic products next two weeks	1	5	3.54	1.24
PBC05	Not use disposable plastic products next two weeks is (definitely beyond my control – definitely under my control)	1	5	3.34	1.10
PBC06	For me not to use disposable plastic products next two weeks is (completely impossible – definitely possible)	1	5	3.46	1.10

Note: Min – minimum; Max – maximum; SD – standard deviation.

Intention: the six items used to measure intent (Table 4) are based on behaviour of not using disposable plastics in the following two weeks.

Table 4 Intention scale

Items		*Min*	*Max*	*Mean*	*SD*
INT01	I am planning to not use disposable plastic products next two weeks	1	5	2.87	1.06
INT02	I am likely to not use disposable plastic products next two weeks	1	5	2.69	1.06
INT03	I have decided to not use disposable plastic products next two weeks	1	5	3.59	1.05
INT04	I expect I will not use disposable plastic products next two weeks	1	5	3.76	1.18
INT05	I intend to not use disposable plastic products next two weeks month (definitely not – definitely yes)	1	5	3.32	1.04
INT06	I will probably not use disposable plastic products next three months (definitely will not – definitely will).	1	5	2.85	1.09

Note: Min – minimum; Max – maximum; SD – standard deviation.

Behaviour (not use disposable plastic): respondents were asked how often they performed certain behaviours related to the use of disposable plastics during the previous two weeks (Table 5). In the first five items (BEH01 to BEH05) a 5-point scale from *never* to *always* was used and in the BEH06 item a 5-point scale from *none to many*.

Table 5 Behaviour scale

Items		*Min*	*Max*	*Mean*	*SD*
BEH01	In last two weeks, when shopping, I ask for paper bags rather than plastic ones	1	5	2.6	1.39
BEH02	In last two weeks, when shopping I used reusable plastic bags	1	5	3.97	1.17
BEH03	In last two weeks, when shopping I bought products in bulk and not packed in disposable plastic	1	5	2.63	1.17
BEH04	In last two weeks, I rejected disposable plastic products (for example: spoons, straws, cups, etc.)	1	5	3.06	1.38
BEH05	In last two weeks, I made an effort to not use disposable plastics in my daily life	1	5	3.33	1.24
BEH06	How many disposable plastics did you used last two weeks (many – none)	1	5	2.96	1.10

Note: Min – minimum; Max – maximum; SD – standard deviation.

For the lifestyle scale, 20 items from the lifestyle scale were used (Table 6) proposed by Fraj and Martinez (2006), which consists of aspects related to ecological standards, healthy food and lifestyle healthy way of life. Answers were provided on a 5-point scale (*strongly disagree – strongly agree*).

Table 6 Lifestyle values scale

Items		*Min*	*Max*	*Mean*	*SD*
LFS01	The current civilisation is destroying nature	1	5	4.41	0.75
LFS02	I prefer consuming recycled products	1	5	3.88	0.92
LFS03	I throw garbage in selective containers	1	5	3.70	1.34
LFS04	The environment deterioration will be irreversible if the necessary measures are not taken	1	5	4.52	0.75
LFS05	I participate in environment conservation tasks	1	5	2.64	1.22
LFS06	I worry about the human activity consequences on the climatic change and act consistently	1	5	3.91	0.97
LFS07	I control the salt ingestion	1	5	3.65	1.20
LFS08	I practice a vegetarian diet	1	5	1.89	1.16
LFS09	I regularly do exercise	1	5	3.29	1.29
LFS10	I try not to eat pre-cooked food	1	5	3.58	1.22
LFS11	Often eat fruits and vegetables	1	5	4.14	0.99
LFS12	I eat red meat moderately	1	5	3.60	1.16
LFS13	I belong to a pro-environmental association	1	5	1.56	1.01
LFS14	I try to eat food without additives	1	5	3.22	1.21
LFS15	Periodically, I check my health voluntarily	1	5	3.2	1.25

Note: Min – minimum; Max – maximum; SD – standard deviation.

Table 6 Lifestyle values scale (continued)

Items		*Min*	*Max*	*Mean*	*SD*
LFS16	I try to reduce stress	1	5	3.71	1.09
LFS17	Regularly visit the dentist	1	5	3.57	1.13
LFS18	I try to take an arranged and methodical life	1	5	3.73	0.95
LFS19	I try to find the balance between work and my private life	1	5	3.96	0.88
LFS20	I read the products labels	1	5	3.5	1.29

Note: Min – minimum; Max – maximum; SD – standard deviation.

The social media engagement scale (Table 7), adapted from Han et al. (2018) includes four items. All these responses were provided on a 5-point scale with endpoints labelled either *strongly disagree* and *strongly agree*.

Table 7 Social media engagement scale

Items		*Min*	*Max*	*Mean*	*SD*
SME01	Frequently I visit online environmental community and see posts that related to pro-environmental behaviour	1	5	2.41	1.27
SME02	When I see pro-environmental related posts on online environmental communities, I usually forward the posts to others, or make a comment.	1	5	2.67	1.26
SME03	I am emotionally connected to the online environmental community which discusses pro-environmental behaviour	1	5	2.50	1.25
SME04	I frequently search for sites with environmental information	1	5	2.44	1.19

Note: Min – minimum; Max – maximum; SD – standard deviation.

2.3 Design model

The lifestyle construct is conceptualised as five-dimensional constructs that capture separate attributes of lifestyle, which were calculated through explanatory factor analysis (EFA). The five components at the first level of abstraction (i.e., first-order or lower-order components – LOCs) form the more abstract higher-order (i.e., second-order or higher-order component – HOCs) lifestyle component. To reduce the number of relationships in the structural model and make the PLS path model more parsimonious and easier to grasp, we apply a hierarchical component model (HCM) using a combination of the repeated indicators approach and the use of latent variable scores in a two-stage HCM analysis (Hair et al., 2017). In the first stage, the repeated indicator approach is used to obtain the latent variable scores for the LOCs (environmental concerns, healthy food, healthy way of life, environment activism and physical health). In the second stage, the LOC scores serve as manifest variables in the HOC measurement model.

Following the key arguments for selecting an appropriate method to estimate structural equation models (Hair et al., 2011, 2012a, 2017; Ringle et al., 2012), we decided to use the PLS-SEM approach for the following reasons:

1 the research goal is to predict the key target constructs and to identify the key 'driver' constructs

2 the structural model is complex

3 the data are clearly non-normal as evidenced in Kolmogorov-Smirnov test results across the subsamples

4 the latent variable scores are needed in subsequent analyses.

2.4 Data analysis

In the initial stage, we run an EFA to reduce the lifestyle scale items to a minimum number of factors (lower-order components). In the following stage, we applied a structural equations model (SEM) to the proposed research model (Figure 1).

To run a multigroup analysis on the structural model with the control variables, we had to calculate dichotomous variables for the control variables used in this study, namely age, household, and education. This is necessary because the procedure to compare more than two groups have not yet been included in SmartPLS (Hair et al., 2017). The dichotomous variables were calculated as follows: the moderator variable 'age' consists of the categories '<25 years old' and '>25 years old'. The 'household' moderator variable includes the categories '≤3 members' and '>3 members'. Finally, the categories of the moderator variable 'education' are 'high school or less' and 'graduation'.

Data were analysed using IBM SPSS version 26 to the EFA procedure and SmartPLS, v.3.3.3 (Ringle et al., 2015) to SEM.

3 Results

3.1 Exploratory factor analysis

To determine lifestyle first-order constructs we run an exploratory factor analysis (EFA) on the matrix of correlations, with factor extraction using the principal components method followed by a varimax rotation. The common factors retained were those with an eigenvalue greater than 1, in line with the scree plot and the percentage of retained variance. To assess the validity of the EFA, the KMO criterion (Kaiser-Meyer-Olkin measure of sampling adequacy) and the measure of sampling adequacy (MSA) were used for each of the variables in the analysis. Having observed a KMO = 0.819 and all MSA values above 0.50 (Hair et al., 2014), the EFA was performed. The model quality was evaluated from the observed residual values, considering that the model presents good quality when the percentage of non-redundant residuals with absolute values greater than 0.05 is less than 50% (Hair et al., 2014).

EFA procedure yield five dimensions (Table 8): environmental concerns (ENC), healthy food (HTF), healthy way of life (HEAF), environment activism (ENA) and physical health (PHH)), which explain 55.04% of the total variance. The Cronbach's alpha values, which are found for assessing reliability on terms of internal consistency of the observed variables regarding the factors, are greater than or equal to 0.7 (Hair et al., 2014), except for the ENA e PHH dimensions, so it can be considered that the model presents good reliability. The factorial model is of good quality, as 55% of the residuals are less than 0.05.

Table 8 Lifestyle values scale validation

Constructs	*Items*	*Factor loadings*	*Communalities*	*Internal consistency*	*Coefficients*
ENC	LFS01	0.77	0.63	Cronbach's alpha	0.71
	LFS02	0.64	0.55	Explained variance	13.57
	LFS04	0.76	0.60	Eigen value	4.40
	LFS06	0.67	0.53		
HTF	LFS07	0.61	0.46	Cronbach's alpha	0.69
	LFS10	0.72	0.61	Explained variance	12.92
	LFS11	0.55	0.46	Eigen value	1.73
	LFS14	0.72	0.64		
HTW	LFS16	0.61	0.51	Cronbach's alpha	0.71
	LFS18	0.79	0.73	Explained variance	11.92
	LFS19	0.84	0.73	Eigen value	1.63
ENA	LFS05	0.72	0.67	Cronbach's alpha	0.62
	LFS08	0.70	0.66	Explained variance	11.43
	LFS13	0.69	0.52	Eigen value	1.25
PHH	LFS12	0.63	0.60	Cronbach's alpha	0.55
	LFS15	0.54	0.51	Explained variance	9.22
	LFS17	0.73	0.66	Eigen value	1.03

These five dimensions were used in the hierarchical component model and the scores obtained along the second stage serve as manifest variables on the lifestyle latent variable.

3.2 Model estimation and results evaluation

SmartPLS 3.3.3 (Ringle et al., 2015) was used to compute the path model and parameter estimation was carried out based on the path weighting scheme (Hair et al., 2017; Henseler et al., 2009).

In evaluating and reporting the PLS path modelling results, we follow recent guidelines for PLS-SEM by Benitez et al. (2019), Hair et al. (2012a, 2012b, 2017, 2019) and Henseler et al. (2016).

3.3 Measurement models

The reflective measurement models need to be assessed for their reliability (i.e., the construct measures' indicator reliability and internal consistency reliability) and validity (i.e., convergent and discriminant validity).

The first step in reflective measurement model assessment involves examining the indicator loadings. Some of the indicators have outer loadings of less than 0.70 (Table 9), which is a normal situation in social science studies (Hulland, 1999). As the indicators with outer loadings between 0.40 e 0.70 don't increase the composite reliability or the average variance extracted (AVE) when removed from the correspondent scales, we decided to maintain those indicators in the measurement models (Hair et al., 2017). However, we removed the indicator 'BEH02: In last two weeks, when shopping I used reusable plastic bags' with outer loading less than 0.40 (0.349). We can conclude that the indicators in the reflective measurement models reach satisfactory indicator reliability levels. Internal consistency reliability is achieved since all composite reliability and Cronbach's Alpha indicators (Table 9) are above 0.70 (Hair et al., 2019).

Table 9 Measurement models results

Constructs and manifest variables	*Loadings*	*Cronbach's alpha*	*Composite reliability*	*Average variance extracted*
ATT: attitude toward the behaviour		0.946	0.957	0.788
ATT01	0.859			
ATT02	0.889			
ATT03	0.888			
ATT04	0.904			
ATT05	0.897			
ATT06	0.887			
SBN: subjective norm		0.782	0.846	0.481
SBN01	0.641			
SBN02	0.729			
SBN03	0.547			
SBN04	0.805			
SBN05	0.668			
SBN06	0.774			
PBC: perceived behavioural control		0.755	0.831	0.457
PBC01	0.718			
PBC02	0.537			
PBC03	0.554			
PBC04	0.590			
PBC05	0.781			
PBC06	0.822			

Table 9 Measurement models results (continued)

Constructs and manifest variables	*Loadings*	*Cronbach's alpha*	*Composite reliability*	*Average variance extracted*
INT: intention		0.851	0.889	0.575
INT01	0.770			
INT02	0.748			
INT03	0.711			
INT04	0.645			
INT05	0.834			
INT06	0.826			
BEH: behaviour		0.700	0.804	0.460
BEH01	0.548			
BEH02	0.349			
BEH03	0.568			
BEH04	0.797			
BEH05	0.823			
BEH06	0.599			
SME: social media engagement		0.885	0.921	0.743
SME01	0.845			
SME02	0.849			
SME03	0.880			
SME04	0.875			
LFS: lifestyle		0.707	0.802	0.450
ENA	0.726			
ENC	0.683			
HTF	0.758			
HTW	0.583			
PHH	0.584			

The metric used for evaluating a construct's convergent validity is AVE for all items on each construct. Given that not all AVE values are higher than the critical threshold value of 0.50 (Table 9), we conclude that there is a weak convergent validity. Finally, we assess the discriminant validity by using the heterotrait-monotrait (HTMT) criterion (Henseler et al., 2015). All the results are clearly below the conservative threshold of 0.85 (Table 10). Next, we run a bootstrap procedure with 5,000 samples, BCa bootstrap confidence intervals, and two-tailed testing at the 0.05 significance level (which corresponds to a 95% confidence interval). The results show that none of the HTMT confidence intervals includes the value 1, suggesting that all the HTMT values are significantly different from 1. We thus conclude that discriminant validity has been established.

Table 10 HTMT values

	ATT	*BEH*	*INT*	*LFS*	*PBC*	*SME*	*SBN*
ATT							
BEH	0.357						
	[0.262; 0.448]						
INT	0.269	0.535					
	[0.180; 0.368]	[0.432; 0.629]					
LFS	0.331	0.607	0.220				
	[0.213; 0.434]	[0.504; 0.699]	[0.129; 0.303]				
PBC	0.188	0.520	0.503	0.324			
	[0.101; 0.283]	[0.414; 0.614]	[0.398; 0.596]	[0.214; 0.411]			
SME	0.293	0.541	0.164	0.670	0.302		
	[0.180; 0.396]	[0.440; 0.625]	[0.079; 0.266]	[0.589; 0.743]	[0.205; 0.405]		
SBN	0.343	0.378	0.189	0.315	0.245	0.352	
	[0.233; 0.447]	[0.265; 0.464]	[0.129; 0.229]	[0.207; 0.424]	[0.153; 0.321]	[0.236; 0.447]	

Note: The values in the brackets represent the lower and the upper bounds of the 95% confidence interval.

The measurement model assessment substantiates that all the construct measures are reliable and valid. Based on these findings, we next evaluated the results of the structural model focusing on the model's predictive capabilities and the hypothesised relationship between the constructs.

3.4 Structural model

Before assessing the structural relationships, collinearity must be examined to make sure it does not bias the regression results. Analysis of the Variance Inflation Factors (VIF) (Table 7) revealed values less than the benchmark of 5 (Hair et al., 2019). This means that multicollinearity among variables is not a critical issue and is not an obstacle to subsequent statistical tests.

We used the bootstrapping procedure described previously to assess the significance of path coefficients. (Table 11) All path coefficients have statistically significance (*p-value* < 0.001 and the confidence interval does not include zero), except the path 'SBN → INT'. So, all the research hypotheses are supported as the proposed relationships among variables are confirmed (except H_{1B}).

Table 11 Path coefficients of the structural model and significance testing results.

	VIF	*Path coefficient*	*95% BCa confidence interval*	*p-value*	*f^2 effect size*	*q^2 effect size*
ATT → INT	1.106	0.168	[0.059; 0.272]	< 0.001	0.033	0.015
INT → BEH	1.233	0.289	[0.191; 0.385]	< 0.001	0.112	0.035
LFS → ATT	1.000	0.281	[0.173; 0.367]	< 0.001	0.086	
LFS → BEH	1.565	0.253	[0.158; 0.338]	< 0.001	0.068	0.023
PBC → BEH	1.292	0.153	[0.065; 0.233]	< 0.001	0.030	0.005
PBC → INT	1.043	0.393	[0.292; 0.476]	< 0.001	0.189	0.093
SME → BEH	1.554	0.211	[0.120; 0.296]	< 0.001	0.048	0.017
SME → LFS	1.000	0.588	[0.519; 0.644]	< 0.001	0.528	
SME → SBN	1.000	0.295	[0.195; 0.370]	< 0.001	0.095	
SBN → INT	1.107	0.047	[–0.068; 0.157]	0.417*	0.003	0.001

Note: *Not significant at $p < 0.05$.

The primary criterion for structural model assessment is the coefficient of determination (R^2), which represents the amount of explained variance of each endogenous latent variable (Hair et al., 2012b) and is a measure of the model's explanatory and predictive power. All the R^2 values (Table 12) have statistically significance (*p-value* < 0.001 and the confidence interval does not include zero) and most of them are greater than 0.20, which are considered high values in disciplines such as consumer behaviour (Hair et al., 2017).

Table 12 Coefficient of determination (R^2) and model's predictive ability (Q^2)

	R^2	*95% BCa confidence interval*	*p-value*	*Q^2*
ATT	0.079	[0.030; 0.135]	<0.001	0.060
BEH	0.397	[0.316; 0.456]	<0.001	0.174
INT	0.218	[0.130; 0.288]	<0.001	0.120
LFS	0.346	[0.268; 0.414]	<0.001	0.136
SBN	0.087	[0.039; 0.138]	<0.001	0.039

Note: *Not significant to $p < 0.05$.

The f^2 effect size evaluates the change in the R^2 value when a specified exogenous construct is omitted from the model. According to the threshold values (0.02 – small, 0.15 – medium, 0.35 – large effects) indicated by Hair et al. (2019), we conclude that only the exogenous construct 'subjective norm' has no effect ($f^2 < 0.02$) on the endogenous latent variable 'intention'.

To assess the model's predictive ability, we used the Q^2 value calculated with a blindfolding estimation procedure using an omission distance D = 7, where $Q^2 > 0$ means that the latent endogenous variables have predictive relevance (Hair et al., 2019). As all Q2 values are between 0 and 0.174 (Table 12), it can be concluded, using the threshold values (0.00 – small, 0.25 – medium, 0.50 – large) indicated by Hair et al. (2019), that all the constructs have small predictive relevance of the PLS-path model.

To evaluate the relative impact of the predictive relevance of an exogenous construct on the reflective endogenous latent variable we computed manually the metric q^2 effect size (Hair et al., 2017).

Analysing the q^2 values (Table 11) and considering the same threshold values used to evaluate the f^2 effect size, it is possible to verify that all exogenous constructs have a small predictive relevance for the respective endogenous constructs.

Table 13 PLS predict assessment of manifest variables

Item	*PLS-SEM*		*LM RMSE*	*PLS-SEM – LM RMSE*
	RMSE	$Q^2_{predict}$		
ATT01	1.064	0.056	1.058	0.006
ATT02	1.063	0.053	1.067	–0.004
ATT03	1.124	0.038	1.128	–0.004
ATT04	1.075	0.044	1.090	–0.015
ATT05	1.033	0.041	1.043	–0.010
ATT06	1.028	0.045	1.038	–0.010
BEH01	1.348	0.060	1.355	–0.007
BEH03	1.123	0.079	1.139	–0.016
BEH04	1.235	0.194	1.243	–0.008
BEH05	1.111	0.203	1.117	–0.006
BEH06	1.059	0.080	1.036	0.023
INT01	0.997	0.124	1.014	–0.017
INT02	0.984	0.144	0.986	–0.002
INT03	1.043	0.027	1.054	–0.011
INT04	1.179	-0.001	1.175	0.004
INT05	0.968	0.132	0.977	–0.009
INT06	0.998	0.170	0.993	0.005
ENA	0.818	0.334	0.803	0.015
HTF	0.946	0.108	0.945	0.001
HTW	0.992	0.022	0.987	0.005
ENC	0.914	0.168	0.919	–0.005
PHH	0.986	0.030	0.996	–0.010
SBN01	1.065	0.031	1.062	0.003
SBN02	1.114	0.029	1.113	0.001
SBN03	1.164	0.031	1.176	–0.012
SBN04	1.073	0.055	1.083	–0.010
SBN05	0.990	0.041	0.991	–0.001
SBN06	0.982	0.034	0.983	–0.001

To assess the statistical model's out-of-sample predictive power, we run a PLS predict procedure (folders = 10 and one repetition), following the guidelines proposed by Shmueli et al. (2019). All the endogenous constructs' indicators outperform the most naïve benchmark (i.e., the training sample's indicator means), as all the indicators yield Q^2 predict values above 0 (Table 13). The analysis of the PLS-SEM errors suggests that the errors are not normally distributed, but the distribution is not highly non-symmetric (skewness < |1|). Thereby, we base our predictive power assessment on the root mean squared error (RMSE) indicator (Shmueli et al., 2019). Comparing the RMSE values from the PLS-SEM analysis with the naïve LM benchmark (Table 13), we find that the PLS-SEM analysis produces lower prediction errors for all the indicators. As the majority (68%) of indicators in the PLS-SEM analysis yield smaller prediction errors compared to the LM, this indicates a medium predictive power.

3.5 Moderating effects

Finally, we try to find any kind of heterogeneity from the dataset used in this research, because the assumption of relatively homogeneous data characteristics is often unrealistic, given that individuals have different behaviours. To analyse the heterogeneity from the data we use groups of data related to observable characteristics (control variables), such as gender, age, household, and education. Before running the PLS-MGA (multigroup analysis) we assess the measurement invariance using the measurement invariance of the composite models (MICOM) procedure (Henseler et al., 2016), which is a primary concern before comparing groups of data. After confirming the existence of the configural and compositional invariance of the data we run the PLS-MGA following procedures in Hair et al. (2018). The path coefficients estimate for the separate group models are not statistically significant, leading us to assume that the used dataset does not present any kind of heterogeneity observed in the sample demographic characteristics.

4 Discussion

The aim of this investigation is to analyse which factors influence consumer behaviour in protecting the environment by not consuming disposable plastic products. For this purpose, an extension of the TPB was used, which has been frequently applied to understand the factors underlying various pro-environmental behaviours, namely those relating to waste recycling/management (Mahmud and Osman, 2010; Pakpour et al., 2014), sustainable consumption (Liobikienė et al., 2016; Paul et al., 2016; Yadav and Pathak, 2016), plastic waste (Khan et al., 2019; So et al., 2021), and reduction of the plastic use (Aruta, 2022; Aslam et al., 2019; Batooli et al., 2022; Gulid and Yansomboon, 2022; Sun et al., 2017).

Consistent with theory (Ajzen, 1991) and previous studies (Hasan et al., 2015; Khan et al., 2019; Sun et al., 2017), the findings revealed that the TPB predictors of attitudes and perceived behavioural control positively and significantly predicted the consumers intention behaviour (not consume disposable plastics). This is consistent with TPB model. However, the predictor's subjective norm has no significant effect on the intention.

The results of SEM show that nine out of ten hypotheses are accepted, and intention has the highest positive impact on the non-consumption of disposable plastic behaviour. Possible reasons for these results are discussed further.

The main results indicate that attitudes (H_{1A}, β = 0.168, *p-value* < 0.001) and perceived behavioural control (H_{1C}, β = 0.393, *p-value* < 0.001), have a positive and statistically significant effect on intention. However, the hypothesis that subjective norm has a positive effect on intention is not supported (H_{1B}, β = 0.047, *p-value* = 0.417). The hypotheses arguing that social media engagement has a positive effect on subjective norm (H_{2A}, β = 0.295, *p-value* < 0.001) and on lifestyle (H_{2B}, β = 0. 588, *p-value* < 0.001) are confirmed. Also, the hypothesis that lifestyle has a positive effect on attitude (H_{3A}, β = 0.281, *p-value* < 0.001) is supported. The remaining hypotheses, predicting a positive relationship between perceived behavioural control (H_{1D}, β = 0.153, *p-value* < 0.001), intention (H_{1E}, β = 0.289, *p-value* < 0.001), social media engagement (H_{2C}, β = 0.211, *p-value* < 0.001), and lifestyle (H_{3B}, β = 0.253, *p-value* < 0.001) on behaviour are equally corroborated.

This study has demonstrated that behaviour (not using disposable plastic) can be affected significantly by the consumer's lifestyle, the social media engagement level, the intention to perform a sustainable behaviour of not using disposable plastics and perceived behavioural control. These four predictors explain 39.7% of the variance of the expected behaviour of consumers, which is considered a high value in disciplines such as consumer behaviour (Hair et al., 2017). Indeed, some of the research in sustainable consumption presents R^2 values from 0.2 to 0.4 (Chan and Lau, 2001; Liobikienė et al., 2016; Vermeir and Verbeke, 2008; Zagata, 2012) which are in line with the value present in the present study. It should be noted that in some of the studies on sustainable consumption (Paul et al., 2016; Yadav and Pathak, 2016) and plastic use (Aruta, 2022; Aslam et al., 2019; Batooli et al., 2022; Sun et al., 2017) the key variable is the intention for the behaviour and not the behaviour itself, which reduces our range of comparisons.

Although the predictor 'intentions' alone should be sufficient to predict behaviour (Ajzen, 1991), our findings point out that lifestyle and social media engagement also has an added effect on consumer behaviour. The findings underline the important role that social media engagement takes in this study, assuming itself as an important predictor for behaviour and lifestyle. The importance of consumers' engagement with social media on sustainable consumption emerges as a reflection of the approach of consumers to environmental issues. In fact, those consumers become increasingly active in creating environmentally conscious content (Han et al., 2018) and capable of amplifying environmental concerns and encouraging sustainable behaviour among other people (Sogari et al., 2017).

Social media engagement is a very relevant predictor of lifestyle with a high capability to promote active environmental awareness and a sustainable lifestyle (Kanter and Fine in Sogari et al., 2017). Our findings also highlight the importance of social media engagement on the subjective norm, demonstrating its effectiveness in communicating and promoting social norms that support environmentally responsible behaviour (Ballew et al., 2015). The total effects (direct plus indirect effects) of social media engagement on the behaviour are equal to 0.372, evidencing its importance in our research model. This may explain the lack of significant effect of subjective norms on disposable plastic use intention, as the normative relevance of social media in people's

lifestyles and behaviours aggregates the perception of social pressure (Ballew et al., 2015; Sogari et al., 2017).

The present study also demonstrates that lifestyle is a good predictor of attitudes and behaviour (total effect equal to 0.266), providing a basis for forming attitudes and acting as guidelines for behaviour. Although environmental values are not exactly like lifestyle values, our findings are in opposition with Bleys et al. (2018). In this study, the relationship between environmental values and pro-environmental behaviour is found to be weak (Bleys et al., 2018).

According to Ajzen (1991), the relative importance of attitude, subjective norm, and perceived behavioural control in the prediction of intention is expected to vary across behaviours and situations. In our research, we find that perceived behavioural control is the most important predictor of intention, which is in line with the findings of Aslam et al. (2019), Gulid and Yansomboon (2022) and Hasan et al. (2015) studies. Unlike in others studies (Batooli et al., 2022; Gulid and Yansomboon, 2022; Khan et al., 2019; Sun et al., 2017), the subjective norm has no effect on intention. Consumers' intention to not consume disposable plastics does not depend on the social pressure perceived by them to have a certain behaviour (subjective norm), but it depends, to a greater degree, on the personal assessment of the feasibility of carrying out the behaviour (perceived behavioural control) and, to a lesser extent, the favourable or unfavourable assessment that consumers make regarding the behaviour in question (attitude).

The results also demonstrate that perceived behavioural control has a direct influence on behaviour, in line with Ajzen's (1991) statement that perceptions of behavioural control can make significant contributions to the prediction of behaviour (Ajzen, 1991). This is in contradiction with Kaiser and Gutscher (2003), who argue that TPB must abandon the notion that perceived behavioural control has a direct influence on behaviour.

The control variables like gender, age, and education were used in several studies in reducing plastic use (Aruta, 2022; Batooli et al., 2022; Gulid and Yansomboon, 2022; Hasan et al., 2015; So et al., 2021). Gulid and Yansomboon (2022) using a multigroup analysis concluded that gender has a moderating effect on the hypothesised relationships, namely that attitude and perceived behavioural control had a stronger impact on intention to reduce the plastic bags in females than in male groups. Other studies (Batooli et al., 2022; Hasan et al., 2015; So et al., 2021) use ANOVA and t-tests to investigate gender/age/education differences in the TBP attributes. Since those studies are based on a structural equations model, it does not seem correct to use this type of technique to find heterogeneity in the data. Our study, adopting a MGA, did not find any moderator effects of control variables on any of our model structural relations.

5 Conclusions

The general objective of this study is to investigate environmental behaviour in the purchase, use, and disposal/recycling of disposable plastic products, such as cutlery, plates, bottles, cotton swabs, bags, and packaging for food products, among others. It uses an extension of the TPB model, adding lifestyle and social media engagement as predictors variables. The results show that our model is an adequate framework for the prediction of intention behaviour to not consume disposable plastics.

The results of SEM show that nine out of ten hypotheses are accepted, and intention has the highest positive impact on the non-consumption of disposable plastic behaviour.

This study suggests some implications for theory as well as for management actions. For theory, the findings have proved the usefulness of the TPB model in determining the behaviour to not use disposable plastics products, especially when considering added factors that can increase the predictive power and explanation of the behaviour. Furthermore, the findings provide that the model proposed in this research has a medium predictive power, with all exogenous constructs presenting a relative predictive relevance for all the latent endogenous variables. The study also reveals the role that both social media engagement and lifestyles explain the use of disposable plastics and therefore are variables that should be considered in future research, as they prove to be important factors for sustainable consumption.

For management actions, understanding individual behaviour in the context of (no) consumption of disposable plastics can provide useful input to practical or public programs for environmental protection and encourage people to reject products that impact negatively on the environment. The findings of this study suggest that the government and environmental associations should encourage the creation of online virtual communities to stimulate the sustainable behaviour of individuals, as well as support the development of social networks that can actively promote environmental awareness and a sustainable lifestyle. This recommendation is online with the Zheng et al. (2022) preposition that social media is a powerful tool for public education, and learning about environmental protection though it could be an effective way to increase the public willingness to protect the environment. This approach is supported by the results obtained through an importance-performance map analysis, which relies on total effects (importance) and the latent variables scores (performance, on a scale from 0 to 100). The results show that social media engagement represents potential areas of improvement that should receive higher attention.

The study has some limitations that should be addressed in further research. The study limits itself to university students, friends, and family, which may bias the result as educated consumers may be more prone to have pro-environmental behaviour and be active in social media. The results might not, therefore, be generalisable to the general population.

Future research could improve the predictive power of the framework by integrating additional constructs from past literature and can include a sample from a diverse demographic population that will help to report generalised findings. Also, it must attempt to find any kind of heterogeneity in data because individuals have different behaviours and is often unrealistic that data characteristics are relatively homogeneous. The role of social media engagement in the present social context where it plays a relevant role in people's lives, could be explored in future studies as an important socio-normative determinant factor of pro-environmental behaviour.

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